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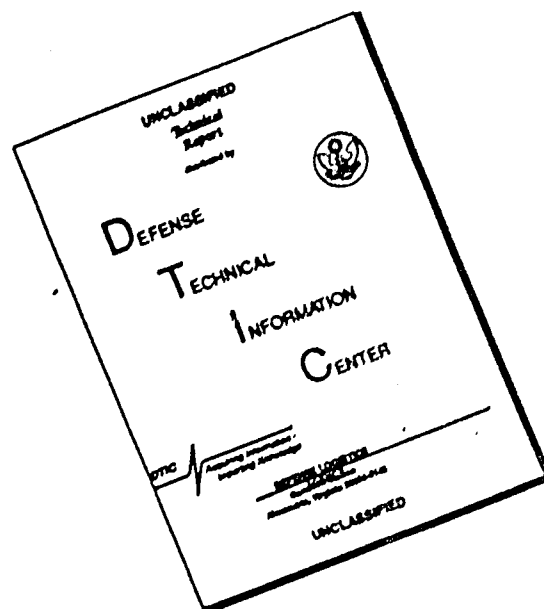
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HEADQUARTERS
70TH ENGINEER BATTALION (COMBAT)(ARMY)
APO 96294

EGC-70E-CO

31 October 1966

AD 824619

SUBJECT: Operational Report-Lessons Learned (RCS CSFOR-65), for Quarterly Period Ending 31 Oct 66.

THRU: Commanding Officer
937th Engineer Group (Cbt)(A)
APO 96318

Commanding General
18th Engineer Brigade
APO 96307

Commanding General
United States Army, Vietnam
ATTN: AVC-DH
APO 96307

Commander in Chief
United States Army, Pacific
ATTN: GPOP-MH
APO 96558

TO: Assistant Chief of Staff for Force Development
Department of the Army (ACSFOR DA),
Washington, D. C. 20310

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ATTN: "FOR-OT-RV"
WASH. D.C. 20310

REC'D
JAN 2 1968
REGISTRATION
63D

Section I Significant Organizational Activities:

1. During this reporting period this organization engaged in extensive construction projects normally associated with construction battalions. The requirements of the command and the lack of major tactical activity in the immediate area have contributed to this situation. Primary projects have been the construction of a Logistical Complex which includes earthwork, concrete, erection of steel warehouses, prefabricated reefers and tropical wood frame warehouses, construction of ammunition berms, open storage area and road networks; a security lighting system which circumvents the 1st Air Cav Div's base camp and involves the erection of 374 poles

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Depot at Qui Nhon to determine the material available. Lack of a realistic ASL on many items, such as field range parts, has resulted in a high dead-line rate on all types of equipment. All types of electrical material, plumbing material, and hardware items have been in short supply, with the demand for these items far exceeding the available supply rates. This organization handles an average of 400 tons of construction material weekly, yet does not have any MHE authorized and is authorized only two men with engineer supply MOS's. To partially alleviate this problem the company supply clerks have been assigned to the S4 section.

Section II Part I. Observations (Lessons Learned)

1. Personnel

Finance Records

ITEM: Incomplete Finance Records

DISCUSSION: Finance Records of incoming personnel are frequently incomplete and lacking certain items. Primarily the following are missing or incomplete:

1. DA Form 1341 - Start and stop of allotments.
2. Orders effecting promotion and reduction.
3. Orders effecting Superior Performance and Specialty Pay.
4. Partial and casual pay vouchers are not in FDRF when EM had FDRF in his possession at time payment was made.

OBSERVATION: Individuals are being sent to Vietnam from other commands without proper finance documents.

2. Operations

Erection of Lightpoles

ITEM: Erection of Lightpoles for Security Lighting

DISCUSSION: Excessive rain and old rice paddies caused flooding of areas where lightpoles were programmed to be placed. Due to the soft ground and lack of ample dry fill for a roadway access, the use of a 20 ton crane or wrecker was impossible. Forty (40) pound shaped charges were used to blast the holes and a Chinook C-47 helicopter was used to place ten 2,500 lb concrete poles in one haul. Normal placement time would have been one week.

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OBSERVATION: The imaginative use of a helicopter to accomplish difficult tasks should always be considered.

Monsoon Construction

ITEM: Earthwork during Monsoon Season.

DISCUSSION: Due to the limited amount of earthwork that can be done by equipment TO & E to a combat engineer battalion, extensive horizontal earthwork cannot be accomplished during the Monsoon Season without augmentation by equipment with greater earthworking capacities.

OBSERVATION: If the tactical situation dictates a definitive need for extensive horizontal earthwork just prior to or during the Monsoon Season, all available heavy earthmoving equipment in the area should be consolidated to accomplish the mission in order to take maximum advantage of dry spells between rains,

Quarry Operations

ITEM: Location of Rock Quarries

DISCUSSION: The efficiency of quarry operations depends on many items other than the location of the pit with regard to job sites. Prime factors are the character of rock produced and the amount of overburden. This unit has a quarry which cannot operate efficiently during rainy weather due to excessive overburden and severely fractured rock which is shattered by dozing rather than blasting. The location of the quarry is in an area where average precipitation is high during 4 months of the year. This severely hampers rock production unless blast rock is transported from another quarry 4 miles distant over a haul distance of twenty minutes.

OBSERVATION: On choosing a location for a quarry & crusher operation in a humid tropical climate, adequate consideration should be given to all possible facets of quarry efficiency rather than hastily choosing the most expedient location in which to operate.

Loading Equipment

ITEM: Loading Equipment

DISCUSSION: Due to extensive construction projects and combat support projects, the amount of loading equipment required far exceeded that assigned a Combat Engineer Battalion under the "D" Series TO & E authorization.

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OBSERVATION: To produce more effective and efficient engineer support in Vietnam, a combat engineer battalion should be issued leading equipment in excess of TO & E.

3. Logistics

Transporting Food

ITEM: Transportation of Ice and Frozen Foods.

DISCUSSION: Transporting of ice and frozen foods in helicopters causes water from the melting of ice to cause dangerous conditions of the aircraft.

OBSERVATION: The standard waterproof bags issued to each individual as organizational equipment, are a readily available waterproof container of suitable size to ship items that tend to produce water when not under refrigeration. These bags are not durable enough to be reused.

Drug Availability

ITEM: Drug Availability

DISCUSSION: An active garrison type aid station has a large requirement for commonly used drugs such as antibiotics, however, this requirement cannot be met expeditiously enough through existing supply channels.

OBSERVATION: Expanding the allowable quantities which could be ordered at one time would alleviate this problem.

Section II Part II Recommendations:

1. Personnel

Incomplete Finance Records: Directives have been published concerning processing personnel for overseas shipment but it appears they are not being followed in all cases. Stricter compliance should be stressed. Class B Agent Finance Officer in this area would speed payment of travel vouchers and clear up back payments which in some cases are as much as 3 months behind upon the individual's arrival in unit.

2. Operations

a. Accessory kits be made available whenever AM-2 matting is installed.

b. Major earthwork should be programmed to coincide with the dry season.

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c. "E" Series TO & E for front loaders should be implemented as soon as possible for combat engineer battalions.

d. Greater emphasis should be placed on the location of Rock Quarries. Every engineer officer should be made aware of the requirements for rock in Vietnam and the characteristics and limitations of quarry equipment.


3. Logistics

a. That TO & E augmentation of MHE and personnel be authorized when combat engineer battalions are assigned construction missions.

b. That additional transportation units be authorized to transport construction materials in RVN.

2 Incl

1. After Action Report -
Golf Course Airstrip
2. After Action Report -
Golf Course Airstrip Repair


JOHN R. REDMAN
LTC, CE
Commanding

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HEADQUARTERS
70TH ENGINEER BATTALION (COMBAT) (ARMY)
APO 96294

EGC-70E-3

11 September 1966

SUBJECT: After Action Report - Golf Course Airstrip

TO: Commanding Officer
937th Engineer Group (Combat)
ATTN: EGC-3
APO 96238

1. MISSION: On 11 July 1966, this unit received the mission of rehabilitating the Golf Course Airstrip and installing AM-2 matting over the existing T-17 membrane. The mission involved the accomplishment of the following specific tasks:

a. Removal of all existing T-17 membrane on the 60 x 3300 foot strip, 2 215 x 36 foot taxiways and a 180 x 900 foot parking apron.

b. Remove all unsuitable material and replace with a suitable fill material, compact and replace the T-17 membrane.

c. Install AM-2 matting on runway and taxiways initially and, as later amended, on the parking apron.

2. General.

a. Company "A", 70th Engineer Battalion, commenced work on the airstrip on 16 July 1966, with an expected completion date of 29 July 1966. The construction directive imposed the requirement that $\frac{1}{2}$ of the strip be open to emergency air traffic at all times, and the airstrip was officially put into operation on 25 August 1966. Additional work on the shoulders and for drainage should be completed by 15 September 1966.

b. Earth work on this project exceeded the original estimates. A total of 1480 cu.yd. of fill and 1000 cu.yd. of 3" (minus) crushed rock was hauled and placed.

c. Airfield rehabilitation required the removal of 248,400 sq ft of T-17 membrane. This was later replaced to include 16,080 sq ft of new membrane which was required to replace the damaged portions of the existing membrane.

d. A total of 1274 bundles of AM-2 matting was utilized on this project.

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e. In addition to the TO&E equipment used on this project the battalion, at times, was augmented with 3 MRS Scrapers, 2 graders, 2 10-ton steel wheel rollers and 1 wobbly wheel roller.

3. Scope of Work.

a. Inspection of the existing runway disclosed that the southern 1000 feet was rutted badly. The average depth of these ruts was 10-12 inches. The existing CBR was 0-2 and in many areas the sub base was saturated. The north taxiway had a CBR of 0 and was completely untrafficable. The parking apron had many soft spots and was receiving runoff from the runway due to poor drainage in the area between the runway and parking apron.

b. Priority of construction was established and Company "A" was given the mission to strip back the southern 1000'. The membrane was completely removed in 200' sections for the entire 1000'. The sub base was removed to a depth of six (6) inches by the MRS Scrapers. At this depth a firm layer of soil was encountered and the insitu CBR was 5-6. Compaction of this layer was accomplished by using a sheeps foot roller and the surface was then scarified and a 6" lift of 3" (minus) crushed rock was hauled in. This rock was compacted by the use of two (2) 10-ton steel wheeled rollers. A capping material consisting of an estimated #4 minus US standard sieve size was hauled in from a borrow pit established in the vicinity of the airstrip. Compaction was effected by using a sheeps foot and two (2) steel wheel rollers. Final grading with three (3) graders brought the transverse slope to 1%. A final CBR of 15+, with readings of 30 in places, was established. The old membrane was replaced and joints were fabricated from membrane taken out of the runway sets. Holes were patched and the membrane was then rolled.

c. The north taxiway was completely reconstructed. The membrane was removed and discarded due to large tears and gaping holes. The sub grade was removed and 3" (minus) crushed rock was used to bring it to grade. Capping material, described above, was brought in and compacted by sheeps foot and two (2) steel wheeled rollers, establishing a CBR of 15-20. It was brought to final grade and covered with new membrane, and the membrane was rolled with a 10-ton roller.

d. The northern 2200' of the runway only required rolling with a steel wheeled roller, with the exception of a few soft spots. In these areas the membrane was removed, the faulty soil removed and rock and capping material was brought in to stabilize the sub base, then the T-17 membrane was replaced and rolled with a 10-ton steel wheel roller.

e. The parking apron required extensive work. Upon removal of the membrane it was found that the sub base was weak and had a CBR of 2. Soil in approximately 50% of the area was stabilized with 3" (minus) crushed rock. The remainder of the sub base was allowed to dry and then compacted. Compaction required the use of a sheeps foot roller and three (3) steel wheeled rollers. It was brought to a final grade allowing a maximum of 3% slope using two (2) graders.

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f. The south taxiway required rolling. The culvert which ran under the taxiway was cleared of sand and debris and a 3" layer of crushed rock was placed behind the headwall to prevent erosion.

g. In preparation for laying the AM-2 matting, the matting was placed along the edge of the edge of the runway and the shipping crates removed. A crew of 21 men consisting of 1 officer, 1 NCO in charge, 3 men with crowbars, 2-1 man crews to pin the matting together and 7-2 man crews to carry the matting from the edge of the runway and connect the matting was used for actual installation. With this size force it was possible to lay 80 square feet of matting per man hour. The 3 men with crowbars were required to pry and lift the matting already placed into a straight line so that the piece of matting being placed could be connected. The slow laying rate, compared to the laying rate in TM 5-366, can partially be attributed to the unevenness of the sub grade. With the type of soil used on the airfield and inexperienced grader operators it was next to impossible to maintain the specification outlined in TM 5-366 which says that the area to be surfaced should be graded so that there is not more than a one inch deviation in twelve feet in any direction. The AM-2 matting was laid in a transverse direction to the runway and proceeded from the southern end to the northern end. The matting was laid in a longitudinal direction to the taxiway and transversely to the parking apron. The matting on the runway, taxiways and parking apron was laid as a continuous pattern with no expedient transition required.

h. On 20 Aug 66 the battalion was notified that the strip had to be ready for use on 25 Aug 66, due to the termination of operation Paul Revere II. Effort was intensified and Company "C" was assigned the mission of assisting Company "A" in laying the matting. The runway and two taxiways were completed at 0600 25 Aug 66, and the first aircraft landed at 1000 25 Aug 66.

i. The drainage between the parking apron and runway was resolved by sloping the area between the runway and parking apron to a common channel feeding into the culvert at the south taxiway. Three (3) MRS Scrapers and three (3) graders were used.

4. Problems Encountered and Solutions Found.

Problem: . . Weather.

Discussion: Almost daily rains played a large part in delaying progress on the airfield. During the day, wet spots were exposed to the sunlight and dried out. After they were dried the area was compacted and rolled. In the late afternoon, rain would fall thereby negating the days work.

Solution: The wet spots were dried during the day and then the T-17 membrane was replaced over these wet spots at the end of the days work and sealed to the extent practicable.

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Problem: Anchorage of the AM-2 matting

Discussion: Since AM-2 matting accessory kits, which contain standard anchorage equipment, were not available no lateral anchorage was installed. To date the cyclic loading rate has been 91 sorties of C-130, C-123 and CV-2 aircraft landing from north to south. The maximum creep to date has been 33 $\frac{1}{2}$ inches south at station #20. Lateral shifting of 8" east was experienced at station #41 (see inclosure 1 for diagram). This expansion appears only in the impact area and the area between the two taxiways. The ends of the runway haven't moved.

Solution: Anchorage consisted of extending the runway at both ends by adding four "runs" and then burying these 3 feet below the surface. With $\frac{1}{4}$ " of play in every 2 feet of AM-2 this creep was expected. At present the runway is being monitored and traffic cycles are being recorded. It is expected that the runway will expand to its ultimate in these areas. After expanding to the fullest, no further expansion is anticipated. The lateral expansion will be corrected by placing steel pickets at every 6th run. Monitoring will continue. The original membrane had non-skid compound applied to it which should help to retard skidding. Proper anchorage with the items in accessory kit would probably have retarded this expansion.

Problem: Dust was a continuing problem.

Discussion: Due to the "prop wash" and the arid soil condition, huge clouds of dust were produced after every landing and take-off. This dust reduced visibility and traveled over the heliport working its way into engine parts and cantonment areas.

Solution: Peneprime, a dust palliative, is presently being used on all bare areas of the shoulders.

Problem: Repair of AM-2 matting

Discussion: After the mortar attack on 3 September 1966 a hole approximately 6" in diameter was discovered in the runway.

Solution: Repair of the AM-2 matting was accomplished by cleaning out the hole and removing the soil that was built up under the matting by the blast. A concrete mix was poured into the hole and T-17 membrane was applied to the AM-2 to waterproof it. An end section from the AM-2 shipping box was then installed over the patch by using screws through the shipping box into the AM-2. This type of patch gave a strong, waterproof, durable patch. This area is inspected frequently and so far has proved effective.

Problem: Shortage of membrane glue

Discussion: Initially, a sufficient amount of glue was not available to seal the membrane where cuts had been made or to repair tears in the membrane. As a result, the liquid contained in the buckets

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of non-skid compound was used as an adhesive. This mixture was relatively ineffective in this particular operation. The mixture "sets up" very slowly and if water touches it prior to hardening the adhesive qualities are lost. Also, dust stirred up by helicopters was caught by the mixture thereby negating the adhesive qualities. It was determined that approximately 4 hours was required for the mixture to become tacky enough to press the patch against the membrane and another 8 hours was required for the patch to firmly bond and the mixture harden.

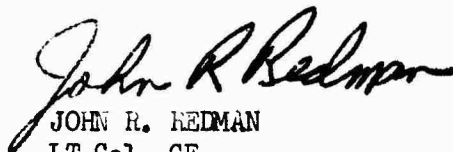
Solution: None was found. Due to almost daily rains, patching efforts were virtually ineffective until sufficient glue was obtained for sealing and patching.

5. Recommendations.

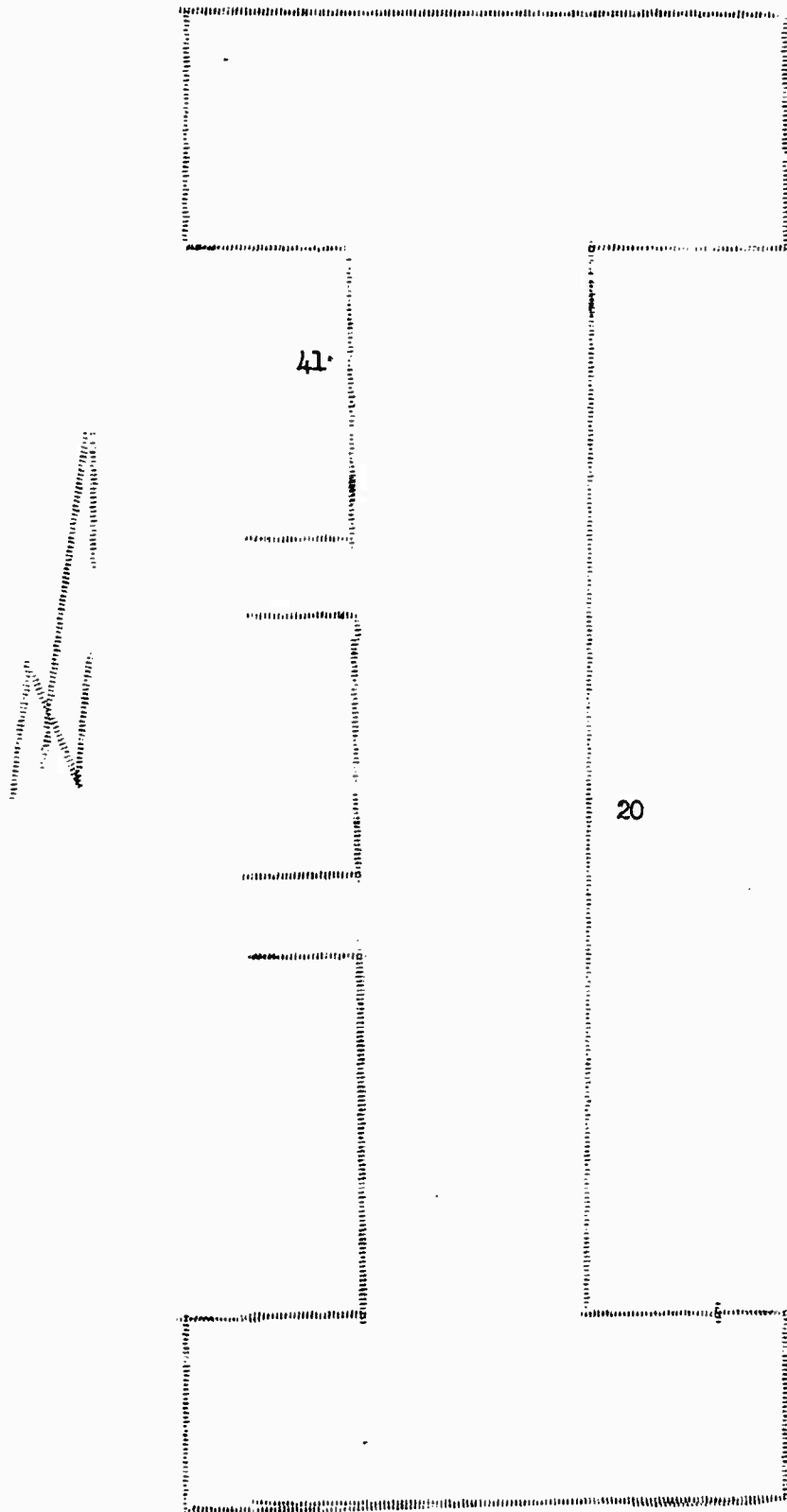
a. That accessory kits be made available when ever AM-2 is installed. The use of standard anchors should retard the creep that was experienced here. The use of the transition sections in the accessory kit will allow the using unit to begin laying AM-2 matting at any point on the surface to be covered. The accessory kits also contains expandable panels that are used in repairing damaged AM-2. This is a necessity for proper maintenance of AM-2 matting.

b. The combination of AM-2 matting and T-17 membrane appears to be operating quite efficiently. The T-17 membrane provides water proofing material for the subgrade and the AM-2 provides a strong landing surface and efficient bridging material over small weak spots. If a failure in the membrane should occur and allow the soil to become saturated then the AM-2 could provide a temporary landing surface until the failure is corrected.

1 Incl
as


JOHN R. REDMAN
LT Col, CE
Commanding

GOLF COURSE AIRSTRIP



Incl 1

HEADQUARTERS
70TH ENGINEER BATTALION (COMBAT)(ARMY)
APO 96294

EGC-70E-CO

9 November 1966

SUBJECT: After Action Report - Golf Course Airstrip Repair

TO: Commanding Officer
937th Engineer Group (Cbt)(A)
APO 96318

1. General: On 19 Sep 66 a pumping action was observed at station #62, (see inclosed map) on the Golf Course Airstrip. This action at this particular time was confined to mud being forced up through the joints in the AM-2 matting. In as much as this was an isolated case and the AM-2 matting did not appear to be undergoing any damage it was decided to have this section monitored closely and keep the airfield open. On 30 Sep 66, personnel observing this area noted that the AM-2 matting was becoming deformed. The area undergoing a deformation process encompassed 1000 sq ft and had deflected approximately 2" vertically. The battalion continued to monitor the strip very closely since it could not be closed due to operation Thayer. At 1245 on 7 Oct 66, a hair line crack (sketch A) was observed in the joint of the end panel of the depression. Landing and taxiing of C-130 aircraft over the section where a depression had formed actually caused the AM-2 panels to become disengaged in two separate places. After removing the AM-2 matting and inspecting the sub-grade conditions the disengaging of the panels was attributed to the failure in the sub-grade, which when taxied upon by C-130 Aircraft effected a rippling action in the AM-2. The strip was officially closed as of 1800 hours 7 Oct 66.

2. Mission: Immediately upon closing the strip the battalion ascertained that repair of 300' of the runway was mandatory. Due to the high priority items being air transported to An Khe in support of operation "Thayer" the 1st Cavalry Division (Airmobile) could only authorize the strip to be closed for 36 hours. The following had to be accomplished in the rehabilitation of the damaged area:

- a. 300' of AM-2 matting was removed and salvaged.
- b. 300' of T-17 membrane was removed.
- c. The areas in the subgrade which had failed were refilled, using a sand-cement and soil-cement mix, and compacted.
- d. T-17 membrane and AM-2 matting was replaced.

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3. Scope of Work.

a. Company "A", 70th Engineer Battalion commenced work on the strip at 1800 hours 7 Oct 66, and the strip was officially reopened at 0400 hours 9 Oct 66, after being closed for 34 hours. During repair of the damaged section the following methods and procedures were utilized:

(1) A loaded 5 ton dump truck was positioned so that its rear tandem straddled the panel to be withdrawn.

(2) A modified short panel (sketch B) with an attached cable for towing was then connected to the one end of the panel and an HD-16 was used to pull the entire section out. This operation was repeated at 5 different locations in order to determine the extent of the area to be repaired and also to facilitate removal of the AM-2.

(3) Removal of the AM-2 matting was accomplished by using 5 - three man removal teams, a three man locking bar extraction team and one man with a crowbar. It was noted during removal of the AM-2 matting that its having acted as a bridging material over the damaged subgrade caused it to deform resulting in seven (7) panels having to be replaced. A total of 375 M/H was expended in the removal of 19,200 sq ft of AM-2.

(4) The T-17 membrane had a tear 75' long in the area of the depression and had rolled back 15-20' in several places. This tear in the membrane allowed water to penetrate the subgrade. Thus saturating the two inches of capping material, which turned into a slurry and was pumped up through the joints of the AM-2 when aircraft landed or taxied over it. All of the T-17 membrane was removed and due to its having sustained numerous small rips in addition to the large tears could not be reused. At station #63 a factory seam had separated for a length of 20-25'. The condition of the subgrade was as described above.

(5) The old membrane was split down the center line and cut laterally every 75' then rolled on the shoulders. A bleeder ditch was dug at the point where the lateral cut intersected the shoulder and the slurry was then screened off using lengths of 1 x 8, 1 x 6, and 2 x 8 material, in addition, two push brooms and shovels were used. An all out effort was made to preserve the rock sub-base.

b. At 2400 hours Company "A" was relieved by Company "C". Company "C" continued to remove the soil slurry and began applying the soil cement and sand-cement as a stabilizer. In areas where the sub-grade was near final grade the cement was mixed with the sub-grade to a depth of 1 inch. The requisite number of bags of cement to cover an area 600 sq ft (10 x 60) were laid out in a line traversing the runway. Mixing was achieved by using shovels and rakes. The formula used was $W \times L \times T \times .25$ bags cement.

W = Width of treated area

L = Length of treated area

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T = Depth mixed

.25 = Cement factor *

In areas where the capping material was eroded down to the sub-base, rock and sand was used to bring the profile back to final grade. The mix design was based on the depth of the sand layer used. In one area where the factory seam in the T-17 membrane split the sub-base was disturbed. Three inch crushed rock was brought in, spread with a grader, compacted, and a layer of sand and cement was used as a stabilizing agent. Water of hydration was obtained from the moisture contained in the soil and sand, and compaction was achieved by driving loaded 5 ton dump trucks over the area and by using a vibra-pac to bring it to final grade.

c. Company "A" relieved Company "C" at 0800 and commenced installing new T-17 membrane. The old T-17 membrane was cut 10' from the edge of the shoulder. These 10' strips were carefully hand washed and force dried using a 210 CFM air compressor. The new membrane was laid, glued and thumb tacked to the old membrane. While the membrane was being installed, it rained hampering gluing operations. The membrane was dried by sprinkling it with Mogas and igniting. The fire was extinguished once the membrane was placed and sealed as of 1500 hours 8 Oct 66.

d. The AM-2 was replaced using the same team organization as described in removal. Due to the failure of the sub-grade and the bridging action of the AM-2, seven panels could not be reused. These were replaced with new panels. At 1800 hours Company "A" had laid 4800 sq ft of AM-2, expending 240 M/H.

e. Company "A" was relieved by Company "C" at 1800 hours and laying of the AM-2 was continued. At 0200 9 Oct 66 the "closing strip" was ready to be inserted. At one end of the AM-2 the closing distance measured 2' - 0" and the other end measured 2' - 8". At the 2' - 0" end a panel was inserted one foot by an HD-16. Loaded 5 ton dumps were backed up to the south taxiway, a distance of 500 ft, and driven towards the closing strip at a high rate of speed. Approximately 75' from the closing strip the brakes were applied. The trucks were carefully backed off and the procedure repeated until the closing distance measured 2' - 0". The closing panel was then inserted by pushing the strip with an HD-16 and the strip was declared open at 0400 9 Oct 66.

* Cement factor based on assumption 6 bags of cement to 1 cu yd of mix.

$$\frac{6 \text{ bags}}{1 \text{ cu yd}} \times \frac{1 \text{ cu yd}}{27 \text{ cu ft}} = \frac{1}{4} \text{ bag per cu ft}$$

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SUBJECT: After Action Report - Golf Course Airstrip Repair


4. Recommendations.

a. Anchorages are a necessity when AM-2 matting is installed. With AM-2 used on a transverse slope the maximum creep was observed in the direction of the slope. Anchorage would arrest this creeping action and prevent the tearing of T-17.

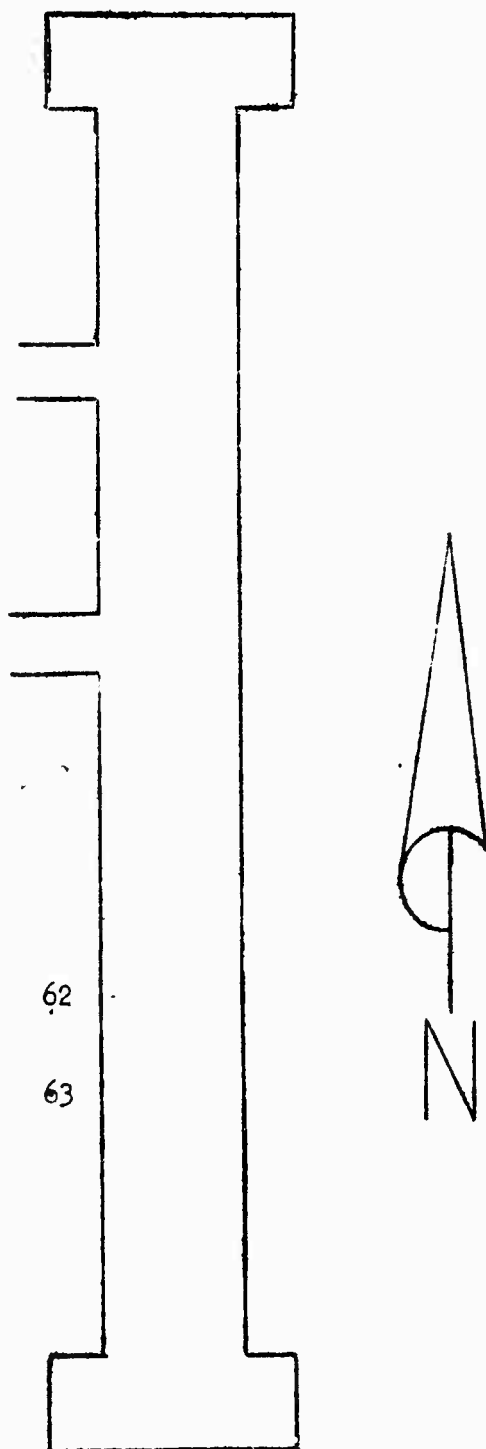
b. If standard anchorage kits are not available, consideration should be given to using an asphalt seal coat for waterproofing under the AM-2 matting.

c. Modified panels should be used in removing a row of AM-2 panels. These panels provide an expedient extraction system. Any removal of AM-2 using the modified panel or insertion of a closing strip using the modified panel should be accomplished by pulling the "run" with a HD-16 dozer. Pushing is undesirable because of possible buckling and destruction of the AM-2 panel.

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JOHN R REDMAN
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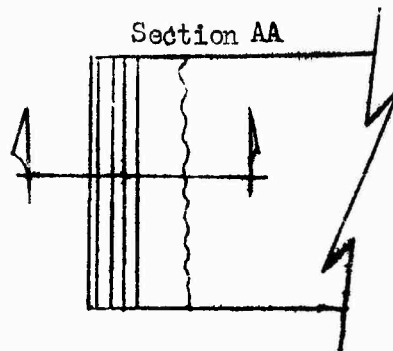
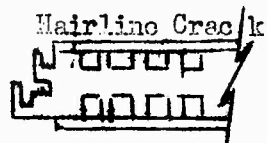
GOLF COURSE AIRSTRIP



Not to Scale

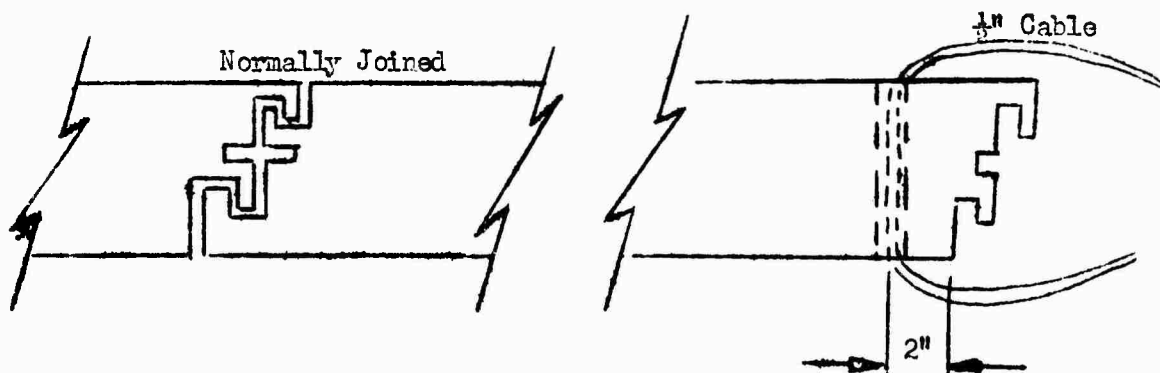
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Location of Hairline Crack



SKETCH A

Modified Panel



SKETCH B